**TOTAL MOISTURE CONTENT OF AGGREGATE BY DRYING
FOP FOR AASHTO T 255
LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS
FOP FOR AASHTO T 265**

Scope

This procedure covers the determination of moisture content of aggregate and soil in accordance with AASHTO T 255 and AASHTO T 265. It may also be used for other construction materials.

Apparatus

- Balance or scale: capacity sufficient for the principle sample mass, accurate to 0.1 percent of sample mass or readable to 0.1 g. Meeting the requirements of AASHTO m 231.

- Containers, capable of being sealed

- Microwave safe containers

- Thermometer reading to 205 ±6°C (400 ±10°F)

- Heat source (depends on method specified)

    – Forced draft oven

    – Ventilated / convection oven

    – Microwave oven (600 watts minimum)

    – Infrared heater, hot plate, fry pan, or any other device/method that will dry the sample without altering the material being dried

- Utensils such as spoons

- Hot pads or gloves

Sample Preparation

For aggregate, select the proper sample size based on Table 1 or other information that may be specified by the agency. Obtain the sample in accordance with the FOP for AASHTO T 2.

TABLE 1
Sample Sizes for Moisture Content of Aggregate

Nominal Maximum Size* mm (in.)	Minimum Sample Mass kg (lb)
4.75 (No. 4)	0.5 (1.1)
9.5 (3/8)	1.5 (3.3)
12.5 (1/2)	2 (4)
19.0 (3/4)	3 (7)
25.0 (1)	4 (9)
37.5 (1 1/2)	6 (13)
50 (2)	8 (18)
63 (2 1/2)	10 (22)
75 (3)	13 (29)
90 (3 1/2)	16 (35)
100 (4)	25 (55)
150 (6)	50 (110)

* One sieve larger than the first sieve to retain more than 10 percent of the material, using specification sieves. See definition on page 18.

For soil, select the proper sample size based on Table 2 or other information that may be supplied by the agency.

TABLE 2
Sample Sizes for Moisture Content of Soil

Maximum Particle Size mm (in)	Minimum Sample Mass g	
0.425	(No. 40)	10
4.75	(No. 4)	100
12.5	(1/2)	300
25.0	(1)	500
50	(2)	1000

Immediately seal or cover samples to prevent any change in moisture content.

Procedure

For aggregate, determine and record all masses to the nearest 0.1 percent or to the nearest 0.1 g. For soil, determine and record all masses to the nearest 0.1 g. When determining mass, allow the sample and container to cool sufficiently so as not to damage or interfere with the operation of the balance or scale.

1. Record the mass of the container.

2. Place the sample in the container, and record the total mass of the container and moist sample.

3. Determine the mass of the moist sample by subtracting the mass in Step 1 from the mass in Step 2.

4. Dry the sample to a constant mass in accordance with the directions given under Directions for Drying below.

5. Allow the sample to cool and record the total mass of the container and dry sample.

6. Determine the mass of the dry sample by subtracting the mass in Step 1 from the mass in Step 5.

Directions for Drying Aggregate

Note 1: AASHTO T 255 specifies a drying temperature of 110 ±5°C (230 ±9°F). A higher temperature may be used if it is proven not to be detrimental to the aggregate and the agency permits the higher temperature.

- Forced Draft, Ventilated or Convection Oven

    1. Spread sample in the container

    2. Dry to constant mass at 110±5°C (230 ±9°F). Constant mass has been reached when there is less than a 0.1 percent change after an additional 30 minutes of drying.

- Other Means

    Note 2: Where close control of temperature is not required, (such as with aggregate not altered by higher temperatures, or with aggregate that will not be used in further tests, or where precise information is not required), other suitable heat sources, such as microwave ovens, hot plates or heat lamps, may be used.

    · Microwave Oven

    1. Heap sample in pile in the center of the container.

    2. Dry to constant mass. Constant mass has been reached when there is less than a 0.1 percent change after at least an additional 10 minutes of drying.

        Caution: Some minerals in the sample may cause the aggregate to overheat and explode damaging the microwave.

    Note 3: Tests on aggregate containing chemically-bound water (hydroxides, chlorates, sulphides, and carbonates, for example) may indicate more moisture than is actually present.

    · Hot plate, heat lamp, Etc.

    1. Spread sample in container.

    2. Stir the sample frequently to avoid localized overheating.

    3. Dry to a constant mass. Constant mass has been reached when there is less than a 0.1 percent change after at least an additional 20 minutes of drying.

Directions for Drying Soil

- Oven (Preferably Forced Draft/Air)

  1. Place sample in container.

  2. Dry to constant mass at 110 ±5°C (230 ±9°F). Constant mass has been reached when there is no change after an additional 1 hour of drying. A sample dried overnight (15 to 16 hours) is sufficient in most cases.

     Note 4: Soils containing gypsum or significant amounts of organic material require special drying. See AASHTO T 265, Note 2

Calculation

Constant Mass:

Calculate constant mass using the following formula:

$$\%Change = \frac{Mp - Mn}{Mp} x100$$

Where: Mp = previous mass measurement
                     Mn = new mass measurement

Example:

Mass of container: 1232.1 g

Mass of container after first drying cycle: 2637.2 g

Mass, Mp, of possibly dry sample: 2637.2 g - 1232.1 g = 1405.1 g

Mass of container and dry sample after second drying cycle: 2634.1 g
Mass, Mn, of dry sample: 2634.1 g - 1232.1 g = 1402.0 g

$$0.22\% = \frac{1405.1 - 1402.0}{1405.1} x100$$

0.22% is not less then 0.1% so it must continue to be dried

Mass of container and dry sample after third drying cycle: 2633.0 g
Mass, Mn, of dry sample: 2633.0 g - 1232.1 g = 1400.9 g

$$0.08\% = \frac{1402.0 - 1400.9}{1402.0} x100$$

0.08% is less then 0.1% so it is dry for an aggregate, but continue drying for soil.
This mass becomes the Dry mass for calculating the moisture content.

Moisture Content:

Calculate the moisture content, as a percent, using the following formula:

$$w = \frac{M_W - M_D}{M_D} \times 100$$

where

w = moisture content, percent
M_W = moist mass
M_D = dry mass

Example:

Mass of container: 1232.1 g
Mass of container and moist sample: 2764.7 g
Mass, M_W, of moist sample: 2764.7 g - 1232.1 g = 1532.6 g
Mass of container and dry sample: 2633.0 g
Mass, M_D, of dry sample: 2633.0 g - 1232.1 g = 1400.9 g

$$w = \frac{1532.6\,g - 1400.9\,g}{1400.9\,g} \times 100 = \frac{131.7\,g}{1400.9\,g} \times 100 = 9.401\% \text{ rounded to } 9.4\%$$

Report

Results shall be reported on standard forms approved for use by the agency. Include:

- M_W, moist mass
- M_D, dry mass
- w, moisture content to nearest 0.1 percent